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IN THE

Supreme Court of the United States

NOS. 2, 3 AND 4, ORIGINAL.

OCTOBER TERM, A. D. 1940.

STATES OF WISCONSIN, MINNESOTA, OHIO and PENNSYLVANIA, *Complainants,* vs. STATE OF ILLINOIS and THE SANITARY DISTRICT OF CHICAGO, *Defendants.*	No. 2 Original.
STATE OF MICHIGAN, *Complainant,* vs. STATE OF ILLINOIS and THE SANITARY DISTRICT OF CHICAGO, *Defendants.*	No. 3 Original.
STATE OF NEW YORK, *Complainant,* vs. STATE OF ILLINOIS and THE SANITARY DISTRICT OF CHICAGO, *Defendants.*	No. 4 Original.

BRIEF AND ARGUMENT OF THE STATE OF ILLINOIS IN SUPPORT OF EXCEPTIONS HERETOFORE MADE BY IT TO THE REPORT OF THE SPECIAL MASTER, MONTE M. LEMANN, DATED MARCH 31, 1941.

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FOREWORD.

The State of Illinois desires to express and acknowledge of record its sincere appreciation to Special Master Monte M. Lemann for his fairness and patience in the conduct of the extended hearings in this cause.

The Special Master's report itself is indicative of his competency and thoroughness. In promptly and properly grasping and describing the complicated science of sewage treatment and its attendant problems, he displayed remarkable ability. The clarity of expression in his report in reducing technical definitions of that art to lay understanding, deserves special commendation.

It is therefore, with all due deference to the integrity and ability of Special Master Lemann, that the State of Illinois finds it necessary to except to that portion of the Special Master's report and his conclusions as to health conditions resulting from the pollution of the waterway, and to except to his failure to recommend the form of decree requested by the State of Illinois to permit a temporary increase in diversion of water, properly supervised, during the summer months of 1941 and 1942, which is the only measure available to ameliorate such conditions pending the final completion in 1942 of the sewage treatment works of the Sanitary District, which work is being vigorously prosecuted.

Introduction.

In the belief that the Secretary of War, acting upon the recommendation of the Chief of Engineers, had authority to abate the existing nuisance on the now Federal Waterway Project by authorizing the diversion of more water, a plea for relief was addressed to the Secretary of War on June 5, 1939, by the City of Joliet, Illinois. The Secretary of War, on September 1, 1939, replied, advising that the report of the United States District Engineer at Chicago, Illinois, stated conditions in the Brandon Road Pool, which extends throughout the City of Joliet, were unsightly, filthy and noisome and much worse than they were last year; that unquestionably the waterway was contaminated by sewage from the Chicago area to a greater extent than contemplated and that remedial action was necessary; that a tem-

porary increase in diversion to 5,000 cubic feet per second was necessary in the interest of public health and to remedy the unsightly and odorous conditions existing in Joliet.

The Secretary of War further stated that, while he was entirely sympathetic with the view of the citizens of the city, he was of the opinion that the War Department was without legal authority to permit any increase in the flow of water from Lake Michigan through the Chicago Drainage Canal and its auxiliary channels or otherwise, and that the withdrawal of lake water was now governed by the decree of the Supreme Court of the United States entered April 21, 1930, and he suggested that it might be appropriate for the State or Sanitary District authorities to apply to the Supreme Court for such modification of the above decree with regard to the diversion of water from Lake Michigan as was necessary under present conditions; that such an application presented a method by which the present unsatisfactory conditions at Joliet might be relieved.

The State of Illinois, in the belief that the Court would not take the inflexible position that nothing short of a fatal epidemic or some similar catastrophe must actually occur or be imminent before any temporary increase in diversion could be considered, filed its petition in this cause for a modification of paragraph 3 of the decree of this Court entered on April 21, 1930, wherein the diversion of water from Great Lakes-St. Lawrence system through the Chicago Drainage Canal was restricted after December 31, 1938, to an annual average of 1,500 cubic feet per second in addition to domestic pumpage, and prayed that the limited diversion be temporarily increased to an annual average of 5,000 cubic feet per second in addition to domestic pumpage until December 31, 1942, so as to avert the obnoxious, noisome, unhealthy and dangerous condition now existing

in the Main Channel and Brandon Pool, otherwise known as the upper end of the Illinois Waterway.

Thereafter, the Court appointed the Honorable Monte M. Lemann as Special Master to make summary inquiry as to conditions, effect and ameliorating measures available and to report to the Court.

The Special Master started the conduct of such hearings in July, 1940. They were conducted intermittently thereafter, concluding in January, 1941. Briefs and reply briefs were submitted by both sides. Arguments were concluded before the Special Master February 19, 1941. The Special Master submitted his comprehensive report to the Court on March 31, 1941. Exceptions were filed to said report by both parties on April 15, 1941, pursuant to the order of the Court. This brief in support of its exceptions is submitted on behalf of the State of Illinois.

Modification of the Petition.

This Court, in its decision, (278 United States 367, page 419) when providing for the graduated reduction of diversion of water from Lake Michigan did so not only with a view of protecting the rights of the complaining states, but also intended thereby to provide for a gradual reduction in diversion of water to avoid any unnecessary hazard to the health of the people of the State of Illinois. The reduction to 1,500 cubic feet per second, in addition to domestic pumpage, after December 31, 1938, was predicated on the assumption that The Sanitary District of Chicago could and would on December 31, 1938, complete the entire sewage treatment program (see also 281 U. S. 179, page 198). The entire sewage treatment program will not and can not be completed by the Sanitary District until the end of 1942.

The evidence and the report of the Special Master shows that conditions prior to 1939 were not satisfactory but The Sanitary District of Chicago, by the installation of its

sewage treatment plants and the treatment of sewage, was able until 1939 to keep pace with and overcome the disadvantages of the reduction of diversion ordered by the Supreme Court. Thus the condition of the Main Channel was kept in status quo from 1929 through 1938 (Illinois Exh. 37). Since January 1, 1939, however, when the diversion was drastically reduced from 5,000 c.f.s. to 1,500 c.f.s., the canal has become heavily polluted, with the result that a very acute and serious condition has existed and continues to exist in the Joliet-Lockport area, which is not only a hazard or menace to health, but has produced an actual injury to the health of persons living in the vicinity thereof.

The evidence adduced and the Report of the Special Master further shows that conditions at Joliet are acute and most serious during the warmer months of the year extending from the beginning of April through October. The State of Illinois, in view of the evidence and the Master's conclusions (Report p. 72 to 109 and 110 to 113, incl.) that there are no other available ameliorating measures, and in accordance with the proof that an increased diversion during the warmer months of the year will remedy the conditions which caused actual injury to health and which will continue to occur during the warmer months of 1941 and 1942, modifies its request for a temporary increase of diversion of water (Special Master's Report, p. 4) and prays that the allowance of increased diversion of water be during the warmer months of the year, extending from the beginning of April through October, and in such amounts of cubic feet of water per second so that a minimum dissolved oxygen content of one part per million is maintained in the water above the dam at Brandon Pool at Joliet, Illinois; and further prays that the decree be modified so that the actual amount of increased diversion of water and the periods of time of such diversion be based on the results of a continuation of the actual analyses made by The Sani-

tary District of Chicago and verified by a competent expert, either an engineer or chemist, appointed by this Court with a provision that the daily reports of the results, together with the record of the increased diversion of flow, be transmitted to the United States Engineer in Chicago and a monthly report filed with the Clerk of this Court and copies thereof transmitted to the respective Attorneys General of the opposing Lake States.

On the basis of the exhibits introduced into the record (Report, p. 4) the expected need for increased diversion in 1941 will be 1,000 cubic feet per second in April; 3,000 cubic feet per second in May; 5,000 cubic feet per second in June; 6,000 cubic feet per second in July; 5,000 cubic feet per second in August; 3,000 cubic feet per second in September; and 1,000 cubic feet per second in October, or an average annual increase in 1941 of approximately 2,000 cubic feet per second. In 1942, the expected need for increased diversion will be 2,000 cubic feet per second in May; 4,000 cubic feet per second in June; 5,000 cubic feet per second in July; 3,000 cubic feet per second in August; and 1,000 cubic feet per second in September, or an annual increase in 1942 of 1,250 cubic feet per second, instead of 3,500 cubic feet per second requested in the original petition filed herein.

Illinois has presented evidence to show what the conditions are expected to be in 1941 and 1942, and the Master has so found (Report, p. 71). If, as contended by the Opponents, the Great Lakes States, such conditions do not arise then, of course, no increase in diversion of water will be necessary. However, if such conditions do occur, and the State of Illinois maintains they will, and the status be established by scientific analyses as proposed in this modified petition, then and then only does Illinois seek a temporary increase in diversion to the extent of producing one part per million of dissolved oxygen in the water above the dam at Brandon Pool so as to ameliorate not only the

menace but the actual injury to health until The Sanitary District of Chicago has completed its construction program, which the proof shows is possible by the end of 1942, but cannot be finished before that time.

No measurable harm will be done to the Great Lakes States by the increased diversion from Lake Michigan, suggested by this modified request of the State of Illinois, which will result in a trifling temporary lowering of the lake levels of Lakes Michigan, Huron and Erie during the years 1941 and 1942. From the findings of the Special Master, Charles Evans Hughes, in 1927, the conclusion is reached that if the aforesaid temporary diversions are allowed, then the temporary lowering effect will be not more than one-half inch in 1941 and not more than one-third inch in 1942 on Lakes Michigan, Huron and Erie (Hughes Original Report 95-96, 104-105; Hughes Re-reference Report 139-140).

The State of Illinois considers that as a result of the able and painstaking report of the Special Master, the issues now before the Court have been narrowed to the following main questions:

(I) What is the actual effect upon the health of the inhabitants of Joliet and Lockport by reason of the introduction of untreated sewage into the Illinois Waterway?

(Illinois Exceptions I and II.)

(II) What was the actual past condition of the Illinois Waterway, by reason of such pollution, and what will be the reasonably anticipated future condition in the summer months of 1941 and 1942, pending the completion at the end of 1942, of complete sewage treatment by the Sanitary District?

(Illinois Exceptions III and IV.)

(III) In view of the Special Master's finding that there are no other ameliorating measures available, is this Court justified in authorizing a temporary increase in diversion during the summer months of 1941 and 1942, in the amounts and under the conditions proposed in Illinois' Petition as modified, in view of the fact the actual effect upon health is serious and in view of the fact that the offensive conditions in the Illinois Waterway at Brandon Road Pool will continue to exist in the summer months of 1941 and 1942?

(Illinois Exceptions V, VI, VIII and IX.)

The Brief and Argument of the State of Illinois will hereafter be directed to these three main questions, in the order designated, without direct reference to the applicable specific exceptions of Illinois. It therefore is to be accepted that such exceptions are embraced under these respective designations.

Illinois Exceptions VII (Exceptions to miscellaneous statements and findings of fact) are considered self explanatory. It will therefore not be necessary to here repeat such exceptions or to present arguments in support thereof.

Note: In the references to the Record which follow, reference to the Joint Abstract is also given, preceded by the abbreviation J. A. Direct quotations are not referred to the Joint Abstract.

I.

What is the actual effect upon the health of the inhabitants of Joliet and Lockport by reason of the introduction of untreated sewage into the Illinois Waterway?

(A) The Issue as to Health Injury.

The petition of the State of Illinois for temporary modification of Paragraph 3 of the decree of April 21, 1930, sets forth allegations with respect to the conditions of the Waterway and the effect upon the health of persons living in the vicinity of the Waterway. That part of the petition with respect to health is as follows:

> "Subsequent to December 31, 1938, when the diversion of lake water was reduced to 1500 cubic feet per second there has been stagnation in the Sanitary District Canal and the Illinois Waterway. This stagnation has resulted in the formation of thick, black, bubbling scum for long distances along the Sanitary District Canal and the Illinois Waterway. Because of the effluent of sewage from the Sanitary District of Chicago into said Sanitary District Canal and the Illinois Waterway a putrescent, obnoxious, noisome and unhealthful odor exists, causing nausea, insomnia, loss of appetite, irritation of the mucous membrane of the nose and throat and in general the undermining of the health of those persons living or working along the Sanitary District Canal and the Illinois Waterway. This condition aggravates illness and retards the recovery of patients ill in hospitals located along said Sanitary District Canal and the Illinois Waterway."

The petition, together with the allegations therein contained, were presented to the Supreme Court of the United States and any reference or further proceeding thereon was resisted by the opposing States. In spite of this opposition the Supreme Court of the United States referred the petition to the Special Master to determine if certain conditions existed. The Court in its reference must have

felt that the petition of the State of Illinois set forth certain allegations which, if proved, merited the serious consideration of the Court, otherwise, it would not have entertained the petition, nor taken any further action on it. It is also obvious that the Supreme Court did not contemplate that the conditions which were adverse to health had to be more serious or more aggravated than was alleged in the petition.

It is also evident that this Court considered the allegations in the petition with reference to injury to health to be sufficient to justify a reference to a Master for the purpose of determining whether or not such conditions actually existed and if there was such injury to health as therein stated.

The allegations of this petition were proved by the witnesses that testified at the hearings, and the allegations as to the offensive odors and their effect upon persons living in the vicinity of the waterway were found by the Special Master to be as alleged in the petition. The Special Master's Report on pages 13 to 26 and 41 to 46 sets forth the testimony of the witnesses which conclusively proved the allegations of the petition of the State of Illinois with respect to health. The Special Master found that the conditions of the Waterway caused witnesses or members of their family to complain of nausea, lack of appetite and inability to sleep, sore throats and nose or sinus trouble, asthma, diarrhea, summer complaint and that children at school were made restless and hard to keep at work, that they had to shut the windows in the school because the odors were offensive; that school children became sick with nausea and had to be taken out of their classes and sent home for a day or so; that the paint on the homes in the neighborhood was ruined by the gas from the canal; that people kept their windows closed to keep out the odors, drove out at night to avoid the odors; that at the hospital Sisters and nurses and many of

the patients of the hospital suffered nervousness, nausea, vomiting, inability to sleep and headaches and some of the patients were anxious to go home because of the odors, and some were so anxious to leave the hospital that they left before their sutures had been removed; that some of the Sisters' and nurses' throats became sore or dry and they had sinus trouble; that windows in the operating room had to be kept shut to keep odors out; that windows in the maternity ward of the hospital had to be kept shut at times, on account of the odors; that patients had asked to be transferred to the side away from the canal on account of the odors; nevertheless he concluded that such conditions causing the complaints aforesaid did not constitute a menace to health within the meaning which he thought the Court intended that phrase to have. He did say, however, on page 54 of his Report (as to such a condition) that the issue is one which only the Court itself can determine.

(B) Menace to Health.

One of the questions of fact to be determined by the Special Master in the order of reference by the Court was with respect to the actual conditions of the Illinois Waterway by reason of the introduction of untreated sewage and whether, and to what extent, if any, that condition constituted an actual menace to the health of the inhabitants of the complaining communities.

Upon an examination of the order of reference the word "menace" immediately comes to our minds as one that requires consideration and definition. The Special Master, in his Report on pages 51 to 54 specifically refrains from defining "menace to health" and leaves the interpretation of this phrase to the Court itself. On p. 54 of the said Report the Master states that the issue of "menace to health" is one which only the Court itself can determine. When it

is necessary to interpret or define words in the English language, it is customary to examine the dictionary for a definition, or if the word or phrase is not adequately defined by the dictionary, then we solicit persons who are experts or specialists in their respective field to give their definition or interpretation of the word or phrase as commonly used, which was done in this case.

Webster's New International Dictionary defines "menace" as being, "projecting, threatening; the show of an intention; to inflict evil; the threat, indication of probable evil or catastrophe to come." In view of the evidence that has been presented in this case it is important for the Court to keep in mind the significant words of this definition, namely, "indication of probable catastrophe to come".

The only definition of "menace to health" which appears in the record in this case was presented by Professor Anton J. Carlson and Dr. Andrew Ivy, witnesses for the State of Illinois. Professor Anton J. Carlson on page 2880 of the Record (J. A. 283) in defining "menace" stated that, "An actual menace to health means that conditions exist that through accidents or ordinary course of human events can lead to injury to health. We must prove that conditions exist which through accidents or in ordinary course of human events, *may* result in injury to health. In other words, it is sufficient to show that a menace is present if a certain condition exists that *may* cause injury to health." This seems to be a reasonable interpretation of the phrase "menace to health", yet the Master on page 52 of his Report does not believe that the Court intended to use the expression "menace to health" in this sense as employed by Professor Carlson. The Master stated that it would not have been necessary to refer the case to him if this definition was followed, because it was apparent on the face of the papers (petition) that the sewage treatment program had not been completed, and that sewage was being dis-

charged into the waterway. He further stated that under these conditions, if the interpretation of Dr. Carlson was used, then a menace would necessarily be found to exist. Because the Master finds the definition of Prof. Carlson an obvious one should be no reason why the use of it should be denied. The Court referred the cause to the Master to determine if certain facts and conditions existed to prove the allegations of the petition of the State of Illinois and the mere fact that the face of the petition sets forth allegations which constitute a menace is no reason why the Master should not accept the reasonable and logical interpretation of the phrase "menace to health" as defined by Prof. Carlson.

It is reasonable to assume that the Court when referring this cause to the Master, wanted to determine if a condition existed which *may* possibly injure the health of the residents in the vicinity of the Waterway.

In proving a menace to health was it necessary for Illinois to show that an epidemic with increased deaths and illness actually existed? It would appear all that is required is proof that a condition exists which does or may result in injury to health. If petitioner was required to show that an actual epidemic existed, then the Waterway would no longer be a menace or threat, but would be the culmination of the menace into a reality. The State of Illinois in trying to protect its citizens filed its petition in the Supreme Court for relief before more serious injury to health occurred and while the condition that existed was still a menace. It was not incumbent on the petitioner to wait until many people were stricken as a result of the polluted condition of the Waterway before it asked for relief in the Supreme Court.

It is the contention of the State of Illinois that from the evidence, it is readily apparent that a condition exists

which is not only threatening and which indicates a "probable catastrophe to come," but is also an actual unhealthful existing condition not based on theories.

The health problem presented in this case may be divided into two parts, as presented by Dr. Ivy on Page 3036 of the Record (J. A. 306), (1) the potential hazard or threat or damage to health occasioned by the foul or polluted condition of the Waterway; (2) the present actual existing injury to health resulting from the gaseous odors. It is the contention of the State of Illinois that the evidence and the Master's findings fully supports its position that not only is the health of the people being menaced, but in addition their health is now being actually injured by the foul odors which emanate from the pool. This was found by the Master on p. 50 of his Report, wherein he states that the offensive odors given off by the Waterway caused various ailments.

(C) Brandon Pool.

1. *Physical Condition.*

The apparent source of the unhealthful condition seems to be that part of the Waterway known as Brandon Pool. Its actual physical condition and appearance is not disputed by opponent States. After the reduction in diversion to fifteen hundred c.f.s. on January 1, 1939, there was no immediate change in physical appearance perceptible to the casual observer, but with the advent of warm weather starting in the Spring of 1939, a definite change occurred in the appearance of the Pool. A great accumulation of sludge or scum on the surface of the water was evident, the heat causing sludge sewage materials to disintegrate in the lower depths of the water (Rec. 292; J. A. 569) being accompanied by the liberation of gases in the form of bubbles.

Dr. Carlson in describing the Pool on page 2990 of the Record observed "now even today from my examination of Brandon Pool, no matter what they have done, or are doing in the way of adequate treatment, the Brandon Road Pool is still an open sewer."

Professor Ivy stated that the Pool impressed him as being a cess-pool that was uncovered.

One witness who lives near the Pool testified that she saw "a'bout three inches of scum, and that on top of that scum were dead rodents." (Rec. 1172.) Other witnesses stated that the water was black as ink—that it would be bubbling continuously and great gobs of sludge would come up from the bottom. The report of the Secretary of War to Mayor Jones of Joliet, dated December 1, 1939, stated that the conditions in Brandon Pool, which extended throughout the city, were unsightly, filthy and noisome. The record indicates that there was an excess of six feet of sludge accumulated at the bottom of the pool.

2. *Odors.*

The motivating cause for the application of Illinois for relief was the unprecedented foul, putrid and noxious gases and odors liberated from the Waterway after the 1939 reduction in diversion. The residents of the Joliet-Lockport areas are the chief sufferers from these conditions because of the high degree of putrefaction at Brandon Pool, but the problem is by no means confined to this immediate area.

The gaseous odors which emanate from the Pool are explained from a chemical standpoint as the result of a disappearance of oxygen from the water and the creation of an anaerobic condition, which is measured through two types of chemical analyses reflecting the dissolved oxygen and biochemical oxygen demand. The Brandon Pool has

reflected a sharp increase in biochemical oxygen demand since the reduction in diversion.

There is no controversy in the record as to how these gases are generated. The dormant condition of the sludge in the winter and the sudden putrefaction of these sludge deposits when the temperature rises is the major factor in causing the emission of gases and odors.

The record indicates that the vile and nauseous gases and odors which permeate the atmosphere in the vicinity of the Waterway combine two distinct odors, namely, the odor of hydrogen sulfide gas, and second—a fecal stench produced by other putrefactive ingredients.

Hydrogen sulfide gas is a common product of sewage putrefaction and is the most toxic. In the absence of chemical tests, the best way to detect hydrogen sulfide gas is by its characteristic rotten egg odor. The Record in many instances, by the testimony of the professional witnesses, as well as lay witnesses, describes this characteristic odor which is present in the vicinity of the Waterway.

There is no dispute in the record from either respondent's witnesses, or petitioner's witnesses, that hydrogen sulfide gas emanates from the Pool and is in the air in the vicinity of the Pool.

The Master in his report on page 50 found that the odors emanating from the pool are due in part to hydrogen sulfide and in part to other unidentifiable gases.

State of Illinois contends, as proved by the record, that not only is there suffering from hydrogen sulfide, but other putrefactive odors and gases which emanate from the Pool, also work a very definite injury to health. The fecal stench which arises from the Pool is composed of certain unknown ingredients and certain known materials, namely, mercaptan, indol, skatol and cadaverin, which are as in-

jurious to the human organisms as hydrogen sulfide. These odors set up a series of chemical processes known as "nervous impulses" which definitely affect the heart and circulation. Such impulses produce salivation, headache, nausea and loss of appetite (Rec. 2888; J. A. 284). The symptoms which result from these gases, namely, nausea and headache, loss of sleep and loss of appetite definitely injure and undermine the health of the suffering persons. It may be that these persons who suffer from these ailments may continue with their work, or business and every-day life, yet if these symptoms continue, a permanent injury to the human organism will ultimately manifest itself.

This is explained by Professor Carlson in his following statement:

> "* * * a good many men think of these things as psychological, as something that happens not in our material being. The fact is that these things I have described are just as definitely material, the material sequence of events, and have as definite an effect on health as if we were bitten by malaria-carrying mosquitoes, and that mosquito injected a germ into our blood. So these odors, hydrogen sulfide and the other odors, do set up these direct irritants and the secondary sequence in the nervous systems which produce these effects. The present condition down there, certainly as I saw it in the summer of 1939, is more than a menace to health; it is inimical to health." (Rec. 2889.)

In explaining, these odors comprising the fecal stench that bring about a condition of nausea, headache, or loss of appetite, Professor Carlson submitted the following explanation on page 2893 of the Record,

> "What happens there is largely reflex through the nervous system as a result of our social condition. We have associated feces and sewage with dangers to health and in some way or other developed early, no one of us remembers at what time, fecal odors became noxious to all sound human adults that I have met. Fecal odors are noxious."

Dr. Curtis on page 585 of the Record observed that,

> "You cannot become accustomed to that odor. I believe biologically it is impossible because it is the law in life that you cannot live in an atmosphere of your own excreta."

It is quite clear from the record, and there is no dispute as to the condition of the Pool. There is no dispute that certain toxic gases emanate from this Pool. There can likewise be no argument but that these gases are and may be injurious to the health of the residents in the vicinity of the Waterway.

(D) Effect of the Pollution of the Waterway on Persons.

1. *Hospital Patients.*

One of the most devastating results of the condition of the Waterway which indicates a serious menace to health is borne out by the testimony of the nurses, patients and doctors of St. Joseph's Hospital in Joliet, which is located about two blocks from the Waterway. Their testimony was to the general effect that the odors were extremely offensive. The witnesses testified that expectant mothers were affected by the unpleasant smell, and that the windows of the nursery where newly-born babies were kept had to be closed on hot days because of the odors, and because the odors might affect the tender skins of the infants. The patients desired to leave the hospital early because of the stench. Many of the patients complained of nausea and vomiting because of the odor. It was sometimes necessary for the nurses to put cotton in the noses of the patients to prevent the smell. Many left the hospital before their stitches were removed because of the offensive odor. The patients could not rest or get the proper amount of sleep, and the odors were especially harmful to persons with poor or delicate stomachs. The odors generally retarded

the recovery of the patients because they were not able to take the prescribed nourishment that they were supposed to take.

The Master rightfully found on page 18 of his Report that the extremely offensive odors caused many of the patients to be nervous, vomit, have nausea, to be unable to sleep, and have headaches; that many of the patients were anxious to go home and leave the hospital early before their sutures were removed; that some of the Sisters and nurses complained that their throats became sore or dry, and some of them had sinus trouble; that windows in operating rooms had to be kept shut to keep the odors out; that windows also had to be kept shut at times in the maternity ward and nursery, especially when a boat goes by; that odors have a worse effect on new patients, those with delicate stomachs, or very sick patients.

It is quite obvious from this testimony and the findings of the Master in this respect that the odors given off by the Waterway permeated the entire hospital and retarded the normal convalescence of patients hospitalized there, and were and are a distinct and actual menace to the health of these persons.

2. *Lay Witnesses.*

Eighty-one lay witnesses testified as to the effect of the odors upon them or their families. It was also stipulated in the record that if two-hundred additional witnesses were called that they would testify substantially along the same lines. The character of the odors was described by various witnesses as the odor of sewers, out-houses, or rotten eggs, and they deemed the odor "terrible", "vile", "very offensive", and "unbearable." The witnesses testified that because of the odors either they or members of their families suffered from nausea, lack of appetite, inability to sleep, as was found by the Master on page 13 of his Report.

The evidence indicates that in addition to these ailments the odors resulted in additional ailments such as sinus trouble, skin disease and impetigo, headaches, sore throat, diarrhea, dysentery, asthma and secondary anemia. In addition, persons also suffered from skin infections resulting from contact with the water in the Waterway.

The summary of the testimony of the lay witnesses and the effect upon their health is more fully set forth on pages 14, 15, 16, and 17 of the Master's Report. In addition, many of the lay witnesses testified as to the effect of the offensive odors on their every-day life. Many testified that they had to keep the windows of their bedrooms closed at night in order to keep out the smell, and others were forced to spray perfume around their bedrooms. Some had to leave the city to eat their meals, because the odors were so bad.

3. *School Children.*

Probably the greatest menace to health resulting from the condition of the Waterway is indicated by the testimony showing the effect of these odors on school children. The majority of the lay witnesses who were parents testified that the intense odor produced more violent effects upon the children than upon themselves. Nausea, vomiting, loss of appetite, restlessness and diarrhea were the general symptoms observed in the children. Mrs. Marie Bush, Superintendent of the Schools at Lockport, testified (Rec. 335; J. A. 575) that the bad odor was sent through the ventilating fans of the school and that it was the odor of rotten eggs. The Principal of McKinley Public School in Joliet stated that the children complained of the offensive odors; that they were restless and could not get their minds on their work; several children were taken quite sick in school and it was necessary for her to send a child home because of the odor; that it was almost impos-

sible for the children to play in the playground or continue their nature studies because of the unbearable odor. Children were absent from school because of illness resulting from the odors.

The Master on page 51 of his Report concluded that on hot and sultry days school children had been nauseated, and had to lose a day from school.

Providing healthful conditions for children has long been one of the great objectives of government and if the health of children is menaced while they are in the growing ages, it may not immediately be indicated or shown by health statistics, but it is clear that the results of this menace to their health will be apparent in future years.

4. *Joliet Physicians.*

Probably the best source of information to determine whether the condition of the Waterway is in any way jeopardizing the health of the residents adjacent to the Waterway is that testimony given by the officers and doctors of Joliet and Lockport who treated these people, and who were in continuous contact with their unhealthful condition. The City Engineer of Joliet testified that the odor was so bad that he had to leave town, and that the odor was strong enough to wake him out of his sleep. The Health Commissioner of Joliet testified that he had received hundreds of complaints from persons stating that because of the stench from the Canal, persons could not eat, could not sleep, could not work, and that they suffered from nausea, vomiting and insomnia. He further stated that the stench was nerve wracking and produced nausea, loss of sleep, loss of appetite, and the lack of rest and lack of eating brought on a condition of degeneration and lowering of vitality which would lead to more serious conditions.

Dr. G. J. Wilcox, a physician in Joliet affirmed the Health Commissioner's conclusions and Dr. Robert W. Lennon,

an eye, ear, nose and throat specialist of Joliet noted an increase in sinus cases in July, August and September of 1939, and (Rec. 529; J. A. 599) stated that the odor from the Brandon Pool was definitely a factor in causing this increase of sinus infections.

Dr. Thomas H. Wagner, the Government Surgeon in the community of Joliet who takes care of many men who work on the Canal stated that since 1939 the Canal was absolutely a menace. (Rec. 881; J. A. 636.) He has had many cases of skin diseases, pustular eruptions and boils involving the exposed portions of the body which were all traceable to the foul water where persons came in contact with it. Dr. Henry M. Beckwith, a Joliet physician, stated that (Rec. 929; J. A. 639) the gases that emanate from the Pool displace the oxygen of the blood and that produces secondary anemia, and this is one of the resulting effects upon persons who convalesce from illness.

Many other Joliet physicians testified to the same general effect that the health of Joliet citizens was being menaced by the conditions of the Waterway.

5. *Expert Testimony.*

Dr. Clarence W. Muehlberger, an authority on toxicology, who testified for the State of Illinois stated that he was of the opinion that the nausea, headaches, insomnia and loss of appetite of which the persons in the vicinity of Joliet complained, may have been caused by the hydrogen sulfide which emanated from the Pool. He also stated that the condition surrounding the Waterway constitutes a very definite menace to the health of the people in the region of Joliet. This was found by the Special Master in his Report on pages 39 and 40.

Dr. Hugh McGuigan affirmed the testimony of Drs. Carlson and Ivy, and added that hydrogen sulfide was not the

only thing in the air adjoining the Waterway, but that there were other unknown things which may even be more toxic than hydrogen sulfide. This, the Master found on page 45 of his Report.

The principal witness for the State of Illinois on the question of health was the eminent scientist, Dr. Anton J. Carlson. The experiences and qualifications of Dr. Carlson are more fully set forth on page 41 of the Special Master's Report. His testimony in this case is particularly significant in that it is based not upon a casual superficial survey or inspection of the Waterway, but rather upon study and scientific analysis of sewage and drainage conditions for many years. He is an outstanding authority and has been called upon on many occasions by Governmental bodies to give the benefit of his knowledge and experience in this type of work. His testimony in this case must therefore be accepted with greater weight because it is based upon extensive knowledge, experience and absence of bias.

On page 2882 of the Record, Dr. Carlson stated his opinion as to the effect of the hydrogen sulphide gas upon the human nervous system, heart and other organs that would be affected by the inhalation of this gas. He stated:

> "A". The hydrogen sulphide gas is a highly poisonous gas to the human and animal organism. A great deal of work has been done on this gas because of its industrial importance and health hazards, both on animals and on human beings, particularly on animals. It is about three times as poisonous as carbon monoxide, but not quite as poisonous as the deadliest of all known gases, namely,—I can't recall the gas just this minute—cyanide. We know the acute effects and the chronic effects. It is an irritant gas. It affects the delicate membranes of the eye, conjunctiva, the nose and the throat. There it produces irritation, hyperemia, coughing, and if it goes on longer or in stronger concentration, actual edema of the lung. Some

of the gas, though, acting on this respiratory epithelium or respiratory canal actually gets into the blood and there affects the organs, produces instability of the nervous processes, affects consciousness and reflexes, injures the liver so that in the long run you get varying degrees of anemia.

Now, these are well-known effects if the concentration is sufficient and acts a sufficient length of time. What we are not certain of is as to the minimum in the breathed air that is actually safe for man, and the reason for our ignorance there is this: That the human system can be tremendously injured before we are sick. We can lose over half of the liver before there is any impairment of liver function. Even laymen know that we can lose half of our kidney function before there is any sickness. We can lose more than nine-tenths of our glands of internal secretion before we can demonstrate any defects, so that tremendous amount of injury can be done in the smallest insidious way before the keenest of physicians, the keenest of pathologists or the keenest of investigators can actually prove that injury has been done."

On page 2887 of the Record, Dr. Carlson when asked whether the odors constituted a menace to health, made the following answers:

"A. Well, then my answer is based on the observation of the odors in the summer of '39, the observation of the odors, the kind and intensity yesterday, which was a cool and a calm day, and the testimony in the record that I have read regarding the bacteriology and chemistry of the water, and then my wide experience with human physiology and health and disease and the agencies that act on them.

Yes, those odors, both the putrefactive odors and the hydrogen sulphide, are more than a menace, because a menace is something that may occur but hasn't. Those are injurious to health under certain conditions down there. May I explain?

The Master: Certainly.

A. First, there is no question of hydrogen sulphide being generated and liberated there. The

amount, the concentration, probably varies from time to time. I don't know what it is. It is enough to be smelled. That is a heavy gas, and particularly the homes of the people who live lower than that water level, that will roll over the retaining wall and concentrate down there, unless the wind is very strong.

There is no reason for me to go further into the action of that hydrogen gas. We don't know at what dilution it ceases to be a menace.

Now, the other unpleasant odors, the putrefactive odors, fecal odors, mercaptan and indol and skatol and cadaverin, and so forth, a number of sewer gases that come up. Now, they are quite as material and their effect on the human body, unfavorable effect, is quite as material as the chemical we can see and weigh, acting on the system. In other words, these are different chemicals going through the air affecting the material substance which is our nose or organs. There they set up a series of chemical processes that we call the nervous impulses that affect, in turn, favorably or unfavorably our state of being, our consciousness. They will affect the heart; they will affect the circulation. It may produce headache, produce salivation, nausea, lack of appetite.

Now, if the court please, stop me if I seem impertinent, but a good many laymen think of these things as psychological, as something that happens not in our material being. The fact is that these things I have described are just as definitely material, the material sequence of events, and has as definite an effect on health as if it were bitten by malaria-carrying mosquitoes and that mosquito injected a germ into our blood.

So these odors, hydrogen sulphide, and the other odors do set up these direct irritations and these secondary sequences in the nervous system which produce these effects. The present condition down there, certainly as I saw it in the summer of 1939, is more than a menace to health; it is inimical to health.

Now, the actual menace lies in a different direction, serious menace, apart from the fact that we don't know

just the concentration of hydrogen sulphide which is absolutely noninjurious to man. A pool, if the court please, an open sewer covering six or seven hundred acres in the center of the city laden with the B-coli and the streptococci as shown by the testimony, and I saw nothing to the contrary, and knowing where this comes from, human excreta, there inevitably will be a menace from dysentery bacillus, from typhoid bacillus and from the amoeba of dysentery, and the water doesn't have to be used for drinking or cooking to constitute such a menace, and it doesn't have to occur either for 10 or 15 or 5 years. It is still a menace.

Typhoid Mary cooked for the family for three, four or five years and no typhoid developed and then it happened, and the drinking water at Manteno was just as much a menace five years before the outbreak occurred as that year. I was detached from the Army in the winter of 1919 and did government service in Serbia and in Poland. At that time in those two countries there was a great deal of typhus everywhere, and body lice were everywhere. Now, we know that body lice carry typhus. I couldn't get away from the lice in either country for weeks. I did not get typhus. But while I was there, two or three Americans got typhus, and died from it. Now, simply because I didn't get typhus, that typhus and those lice were still a menace to my health.

Now, the way it works down there is this: These highly polluted—this highly polluted body of water may through accident, through flies or mosquitoes, or spray or wind get on the surface of man, on his clothes, on his skin, or in his food, or even in his drinking water, even in his lunch pail, and anything—we know anything that gets on our skin anywhere—flies don't have to bite, mosquitoes don't have to bite, they don't have to settle on the water. This stuff splashes up on the sides when the boats go through, when they empty their locks and fill them and when the wind blows. Such a polluted, highly infectious body of water of that extent is an actual menace, if I have made my answer clear."

In discussing "menace," the following questions and answers were put to Dr. Carlson by the Master on p. 2901 of the Record:

"Q. Now, this menace, as I understand you, proceeds chiefly from the odors and the hydrogen sulphide, or does it proceed, in your opinion, also from the danger of typhoid and amoebic dysentery? I would like to be as specific as possible.

A. I will be very specific there, if I can. The actual menace would be largely from the infectious organism in the water, and from the hydrogen sulphide.

Q. Well, now, from the infectious organism in the water, how would that translate itself into danger to the human being?

A. By the transfer of these organisms to the surface or into human beings.

Q. How would that take place?

A. That would take place in various ways, by people going in, by flies and other insects getting these organisms on their legs and on their feet and then getting to human beings." * * *

Dr. Carlson on p. 2904 of the Record when questioned by the Master very distinctly sets forth his opinion of the difference between actual injury to health and menace to health as exists in this case. The following were the questions and answers by the Master and Dr. Carlson:

"Q. Now, do you think the menace proceeds chiefly from this danger of infection from flies and insects carrying germs or do you think it proceeds chiefly from these odors?

A. The odors are not a menace; they are actual injury. If the court please, my understanding of menace is something that threatens but doesn't do. When it does, then it is no longer a menace; then it is actual injury.

Q. So the—

A. The odors and the—the odors including hydrogen sulphide are more than a menace; I don't speak of them when I speak of a menace. They are actually injurious now. The menace are these other things,

and what this minimum amount of hydrogen sulphide might do to the human system, there I have an open mind, and, if the court please, that is one of the terrible public health and medical questions before civilization today: What do these little drops of water do to the living machinery, the drops of water that don't produce a recognizable disease today?"

In further discussing the question of menace to health, the Master put to Dr. Carlson the following questions, and he gave the following answers: (Rec. p. 2981)

"Q. Then, for the information of the Supreme Court in considering your testimony I would like to ask whether you think that there is a menace to health to everybody working in a sewerage plant where these odors are more or less constantly present?

A. I should say if the odors are due to gases other than sulphur dioxid, that is sulphuretted hydrogen, the health of those people working there, if the odors produce these symptoms in them, their health is unfavorably affected; that is correct.

Q. As I understand your view, even if these people were never incapacitated from work they would still be a menace to their health, because it is scientifically possible that they may not be prevented from work, there is some undetectable damage going on to their systems which would constitute a menace to health even if they were able to work. Am I understanding you right?

A. Yes, you are understanding me right. You have to have a tremendous amount of injury before you are incapacitated for work.

Q. But you would say that there would still be a menace to health even though you did not receive that amount of injury?

A Oh yes; certainly, certainly.

Q. You see, the Supreme Court is going to have to define what is meant by menace to health, and from the standpoint of a man of science it may very well be given one meaning when, from the standpoint of what the Court has in mind here, it may have another meaning. Nobody but the Court can finally say that.

But I want the Court to be sure that when you use the word 'menace' to health you are using it in a scientific sense, as a theoretical danger which cannot be measured in any statistics, or even in any outward observation by the physician; am I right about that?

A. You are right to a certain extent, but may I correct you to this extent: that I am not testifying here or giving my opinion from theory. I am testifying as to facts, and I have tried to make it plain what I understand by menace and also what I understand by actual injury or unfavorable influence on the human system, quite short of frank disease or incapacitation, as we describe it. I appreciate what you say, that the Supreme Court will have to decide what it has in mind by those terms, but I am also aware that law and courts ultimately will have to square their decisions and their judgment with the facts of science and medicine; and, ultimately, if my judgment—stop me if you want to—

Q. No, you go ahead fully, Doctor.

A. I think the policy that guides us and you and the courts is to take all measures to minimize all these, any or all of these unfavorable conditions, that we can do within the practicability of our knowledge and our civilization."

Dr. Carlson on p. 2986 of the record stated that:

"insomnia, sleeplessness, is not a trifling thing in the matter of health. As a matter of fact we die from lack of sleep much more quickly than we die from lack of food, and sleeplessness, lack of sleep, is one of the serious questions in connection with disturbances of the nervous system. I hope the court will not take lightly any condition that disturbs a person's sleep."

The Special Master on pages 41, 42 and 43 of the Report found the testimony of Dr. Carlson to be substantially as set forth herein, and in his conclusions on the question of health on p. 52 of said Report stated that if the test of menace to health was such as urged by Professors Carlson and Ivy, then a menace would necessarily be found to exist.

Dr. Andrew Ivy, a Physiologist and Professor at North-

western University, testified substantially the same as Dr. Carlson. Dr. Hugh Alister McGuigan, Professor of Pharmacology and Therapeutics at the University of Illinois agreed in the main with the testimony of Doctors Carlson and Ivy.

The State of Illinois respectfully submits that the testimony of such eminent authorities as Dr. Carlson, Dr. Ivy and Dr. McGuigan should be accepted to indicate that the conditions which exist at Brandon Pool are causing injury to the health of the persons in the vicinity thereof by reason of the offensive odors which emanate therefrom, and that there is also a menace to the health of these individuals by reason of the threat or possibility of an epidemic that may arise at any time from the bacteria present in the Pool.

These authorities have presented the only definition of menace to health and it is a reasonable and logical basis for determining the true conditions affecting health which exist at Brandon Pool. There can be no doubt that the court in making its reference to the Master to determine conditions desired to know in what way the health of the persons living in the vicinity thereof was being affected or threatened or menaced. The record is very clear that many persons are actually suffering by reason of the odors. From a medical standpoint they are suffering to a greater degree than they themselves may realize. The effect of the odors upon their system which cause sleeplessness, loss of appetite, vomiting and numerous other results are daily undermining their health to the extent that it may not be actually discernible or result in loss of work until several years thereafter.

6. *Effect of Odors on Nervous System.*

In recent years, medical science has given more and more attention to the nervous system of human beings in relation to health.

When the Supreme Court asked the Master to determine the question of menace to health, it is to be presumed that the word "health" included its present-day scientific meaning, namely, health from the standpoint of the condition of the physical organs, as well as health from the standpoint of the nervous system of the individual. It is not difficult to imagine the effect on the nervous system of this continuous night and day stench, or odor of rotten eggs, on children in schools, workers at work, and housewives at home cooking their meals. If we were to go so far as to assume that there is no immediate menace to the *physical* health of the human being, namely, the physical organs that make up the human being,—what about the menacing disturbances to their nervous systems that result from the stench continuously in the nostrils of these persons? Individuals become disagreeable, ugly, nervous, irritable, dissatisfied, and this as physicians and psychologists have pointed out—is in itself an unhealthful condition because it is not a normal healthful condition of the nervous system. Therefore, if these symptoms are present in individuals as a result of the odors which come from the Waterway—then that part of the health of the individual that makes up his nervous system is being seriously menaced. Not only is the nervous system itself being impaired by these symptoms, but they have a direct effect upon the physical organs of the body, especially the stomach, colon and heart, and tend to break down their resistance and immunity to disease.

The State of Illinois presented the testimony of several hundred witnesses regarding the condition that exists in the vicinity of the Waterway, as it affected them, but it must be kept in mind by the Court that the condition and effects to which these few hundred witnesses testified is not a condition which affects these witnesses alone. Their testimony merely indicates the condition that exists in the vicinity of the Waterway, and also indicates that if this condition continues there is an additional threat that

an epidemic may spread to include fifty thousand people in the City of Joliet alone, and possibly hundreds of thousands of others in that vicinity. Therefore, this condition is not merely an injury and a menace to the few hundred witnesses who were heard by the Master, but is also a menace and injury to the many thousand of innocent citizens who do not even know of this proceeding.

The Master on page 53 stated that we cannot accept as a test of a health menace, the effect of odors upon invalids and persons of less than average health. The State of Illinois does not contend that the condition of the Waterway with its resulting odors is affecting the health merely of persons of less than the average health. The contention of Illinois is that the health of normal persons, as well as those below the average is being affected. The community or the Government must protect those who are below the average in health, as well as those who are of average health. In fact, the condition of the Waterway is a greater actual injury and menace to persons who are below the average in health and thus there is greater reason why the obnoxious condition of the Waterway should be alleviated.

It is significant in this case that the opposing States who contend that no menace to health existed by reason of the condition of the Waterway, did not present a single lay witness who resided in the vicinity of the Waterway to testify that the Waterway was not harmful and did not affect them unfavorably. Surely, if the condition of the Waterway and the odors were not harmful, the opposing States could have found at least one lay witness who might have testified to this effect.

Counsel for the opposing States before the Master presented a Supplemental Brief which contained a table showing a summary and analysis of the testimony of the

witnesses at Joliet with respect to the ailments suffered by them or members of their family. The State of Illinois contends that this summary of the opposing States supports its position, namely, that there really is an actual serious health injury and problem and that many persons are suffering and inasmuch as the said table impressively sets forth the facts as contended by Illinois, we are taking the liberty of presenting in this brief the said table of opposing States, which is as follows:

"TABLE SHOWING SUMMARY AND ANALYSIS OF TESTIMONY OF WITNESSES AT JOLIET.

Impetigo, skin infections, etc.

3 testified they had personally suffered from infections resulting from contact with the water from the canal or as a result of bite by insects carrying germs from canal.

7 testified they knew of cases of impetigo and infection which originated at such source.

Loss of sleep—disturbance of sleep—difficulty of sleeping, etc.

61 testified they were personally so affected.

9 testified that the odors had no effect on their sleep.

29 testified they knew of others whose sleep was affected.

Loss of appetite—inabilty to eat, etc.

27 testified they were personally so affected.

5 testified the odors had no effect on them.

37 testified they knew of others whose appetite was affected.

Nausea.

37 testified to being personally nauseated by the odors.

27 testified to others being so affected.

Vomiting.

9 testified that they personally had been caused to vomit.

9 testified to vomiting in others.

Headaches.

14 testified to suffering from headaches as result of odor.

8 testified to others suffering from headaches.

General.

16 persons testified to no ailments or sickness—but merely that the odor was offensive.

Condition of health.

32 testified that their health was good, fine, O. K. or nothing wrong with it.

3 testified their health was not so good.

3 doctors testified they knew of no case of illness which they could say was attributable to canal.

1 doctor says Joliet is free from typhoid and intestinal infection.

Observation of doctors.

3 doctors testified they personally didn't know of anyone ill from the canal and couldn't say definitely cases of illness were due to the canal (454, J. A. 588, 481, J. A. 592, 503, J. A. 593).

1 doctor testified Joliet has been free from typhoid and intestinal infections (555, J. A. 601).

1 doctor testified odor was a factor in causing increase in sinus condition (529).

1 doctor testified condition at Joliet not a menace to health of average healthy individual (892, J. A. 637).

Miscellaneous ailments and complaints.

13 testified to suffering from throat, nose and sinus difficulties due to the odors.

1 testified to fainting spells.

1 doctor (Lennon) says there is no question about the odor being a factor in causing an increase in sinus infections.

1 testified to school children being restless.

1 testified to school children being sick (no specific type of sickness mentioned).

4 nurses testified to patient going home from hospital before stitches were removed from operation.

1 testified to a patient being committed to Manteno because of hallucinations of a nasal character, caused by the canal odors.

1 testified to patient suffering from gastroenteritis.

2 testified to knowing of cases of dysentery.

3 testified to knowing of diarrhea and summer complaint.

1 testified to member of family suffering sore throat.

3 testified to members of family suffering sores and rashes on body and limbs.

1 testified to member of family suffering from sinus trouble.

2 testified to members of family suffering from asthma.

1 doctor testified to patient suffering from secondary anemia.

1 doctor testified to patient dying from aspirated pneumonia as result of attempted suicide in the canal.

Proximity of Joliet Witnesses to Waterway.

72 resided or worked up to 1½ blocks away from Waterway.

23 resided or worked 2 to 4 blocks away from Waterway.

20 resided or worked over 4 blocks and up to 1 mile away from Waterway.

6 resided or worked more than 1 mile away from Waterway.

14 didn't say or map doesn't show location of their street addresses.

Weight of Witnesses at Joliet.

31 witnesses who testified concerning their weight, obviously were overweight.

1 witness who stated she was then underweight but testified she always regained weight in winter (Mrs. Colvin, R. 1067, J. A. 654).

95 witnesses gave no statement as to weight.

Odors from Waterway in 1939 as compared to 1940.

77 witnesses testified odors from the Illinois Waterway in 1939 were worse than odors from the Waterway in 1940.

20 witnesses testified that odors in 1940 were about the same as in 1939 or were worse in 1940 than in 1939.

Effect of Illinois Waterway on eyes of witnesses.

No Joliet witnesses testified that they suffered from any irritation of the eyes or burning sensation of the eyes.

Effect on persons who fell into the Illinois Waterway.

3 persons who fell or jumped into the Illinois Waterway suffered no permanent ill effects.

1 person who attempted suicide by drowning was rescued and later died of pneumonia.

It should not be forgotten that this is an equity proceeding and equitable principles should apply. The State of Illinois is not asking for any permanent relief that will definitely fix any property rights for many future years. It is merely requesting in equity for a sufficient increase in water that will give its citizens temporary relief from the condition which actually injures and menaces their health. In an equity proceeding the Court must consider

the relative values of the rights which may be given up by one side for the temporary benefit of the other. On the side of the Illinois citizens for their claim in equity we have persons who are suffering from nausea, loss of sleep, nervousness, loss of appetite, vomiting, sinus infections; persons who are not able to eat in their own homes because of the odor; many who cannot sleep in their own homes because of the odor; many who cannot sleep with the windows up at night because of the odor; some persons who have to spray perfume around the bedroom to counteract the odors at night; school children who are absent from school because of the odors, who are nervous and inattentive in the class room, and who are unable to go out and play in their playgrounds, nurses having to put cotton in the noses of the patients because of the odors; patients having to leave hospitals before their stitches were removed; mothers who are about to give birth to children who are unable to keep food on their stomachs because of the odors.

On the one hand we have human beings suffering and menaced, and on the other we have a possible temporary deprivation of a property right. On the side of the petitioner we have health and lives of thousands, and on the side of the respondents we have the alleged property right of a relatively small number.

Equitable principles should guide this Court in exercising its great power to protect the health rights of the many thousands of citizens that are asking only for temporary relief for two summers.

This Court in recent years has tended to strengthen, preserve and protect the rights of the greatest number of individuals, and on the basis of equity it should continue its policy and give temporary relief to the people of the State of Illinois.

I. Conclusions as to Health.

Illinois concludes that it has established that the condition of the Illinois Waterway at Lockport and Joliet is a menace and an actual injury to the health of the residents of these cities. The Court appointed a Special Master who was instructed to determine whether there was an actual menace, as claimed by Illinois. The Special Master found many cases of nausea, vomiting, headaches, sleeplessness, lack of appetite, and similar manifestations of illness, but he concluded that these illnesses were not severe enough to be designated as a menace to health, as he interprets the Court's instructions. It is Illinois' contention that these illnesses were proof of actual injury to health, and that the menace to health still continues in the foul, putrid and odorous condition of the Waterway. Illinois offered eighty-one lay witnesses, and it was stipulated two hundred more could have been called, to testify as to the toxic effect of the gases and odors on their health. Hospital patients, nurses, internes, doctors and school teachers testified as to the actual injury to health caused by the foul condition of the Waterway in 1939 and 1940. The opposing Lake States did not present a single witness from Joliet or Lockport to controvert this testimony, but did offer a supplemental brief in which the cases of illness of Illinois witnesses at Joliet and Lockport were summarized and classified.

Illinois presented testimony of distinguished medical authorities, particularly Dr. Anton J. Carlson, of the University of Chicago, to prove that the stench and toxic gases from the Waterway produce an actual injury to health, which is not shown in statistics of communicable diseases or other reportable health statistics, but which injury insidiously undermines the health of those continuously exposed to such stench and toxic gases. Dr. Carlson asked the Court to recognize the fact that the human

system can be tremendously injured before we are sick; that fecal odors and nauseous gases can set up nervous impulses which will affect the heart, may produce headache, nausea, lack of appetite; that sleeplessness is not a trifling thing in the matter of health; and that these injuries to the human system are more than a menace—they are actually injuries to the health of those people who are subject to the continuous effect of such foul and nauseating odors.

The enlightened, broad and challenging position of Carlson as to the meaning of a menace to health is respectfully presented to the consideration of this Court, as constituting proof of Illinois' position that the condition of the Waterway is a menace to health of the inhabitants of the complaining communities.

II.

What was the actual past condition of the Illinois Waterway by reason of such pollution, and what will be the reasonably anticipated future condition in the summer months of 1941 and 1942, pending the completion at the end of 1942 of complete sewage treatment by the Sanitary District?

The Supreme Court instructed the Special Master to report on "the actual condition of the Illinois Waterway by reason of the introduction of untreated sewage." The actual condition was shown by results of chemical analyses, which provided a precise, scientific basis for comparing past and present conditions. Reliance on these data, rather than on the memory of various witnesses, would have enabled the Special Master to conclude that

(A) The actual condition of the Waterway has been much worse since the flow was cut on January 1, 1939, than at any time since 1925.

(B) The improvement effected by the increasing

degree of treatment of sewage in 1940 was nullified by the outcome of the flushing test, during which test 62,887 additional tons of putrescible sludge and 4,827 additional tons of B.O.D. were deposited and now remain in Brandon Pool.

(C) The condition of Brandon Pool will be worse in the summer of 1941 than in the summer of 1940; worse than in the summer of 1938, worse than in any summer at least as far back as 1925; and almost as bad as in the summer of 1939.

(D) The need for increased diversion will be most acute in the early summer of 1941. Relief from these deplorable conditions, which will soon recur for the third successive summer, can be had only by a modification of the existing decree by the Supreme Court in accordance with Illinois' Modified Petition, which seeks only to relieve the bad condition of Brandon Pool brought about by the premature reduction of diversion to 1,500 c.f.s. before completion of the sewage treatment program of The Sanitary District of Chicago.

(A) The Special Master in his Report relied mainly on the memory of witnesses to compare past and present conditions of the Waterway, and also on his personal brief inspections of July 8, 23, and 24, 1940, to determine the present condition (with no earlier inspections for his own comparison of past and present conditions) rather than on the record of chemical analyses of the water at Lockport shown in Illinois Ex. 37A. He gave some consideration to the analyses in this exhibit (page 70) but apparently did not attach the proper weight to these data which represent a true measure of the actual condition of the Waterway, from March, 1925, through January, 1941. These results must be relied on to answer the Court's question concerning "The actual condition of the Illinois Waterway."

It is remarkable that the results of such exhaustive analyses were available to provide a scientific, quantita-

tive measurement of the changing conditions of the water from month to month, in fact from day to day, over this long period of nearly sixteen years. The record of these results was introduced early in the course of the inquiry (Rec. 271; J. A. 200) as Illinois Ex. 37, which included the average results of analyses from March, 1925, through June, 1940. Later the results were extended, as Illinois Ex. 37A, through December, 1940. Results for January, 1941, were introduced as Mohlman Ex. 20.

Exhibit 37A represents the average results of approximately 115,000 determinations of dissolved oxygen and 29,000 determinations of biochemical oxygen demand, all made in the same laboratory and by the same analytical methods for nearly sixteen years. The results therefore warrant thorough study as an authoritative and precise measurement of the actual condition of the Waterway from year to year, from season to season and from month to month.*

(1) Exhibit 37A starts in March, 1925. The chart shows biochemical oxygen demand on the upper line, dissolved oxygen below it, temperature next, and discharge at Lockport at the bottom. Samples were collected from the Main Channel at Lockport. The results are plotted as monthly averages.

Biochemical oxygen demand expresses the avidity of the sample for dissolved oxygen. It is the standard test to determine the strength of sewage or the degree of pollution of rivers. (See Report of the Special Master, pages 55 and 56.) The monthly results shown in Exhibit 37A show considerable variation from month to month, but in general the range of results throughout the years is remarkably uniform from 1925 through 1938, during a period in which the diversion had been successively reduced from

* For the convenience of the Court in obtaining a graphic picture of conditions in the Waterway from 1925 to 1941, Illinois Exhibit 37A is reproduced in the Appendix hereto. The Court will undoubtedly find that reference to this exhibit will be helpful in the discussion following.

8,500 to 6,500 c.f.s. on July 1, 1930, and from 6,500 to 5,000 c.f.s. on January 1, 1936 (Report of Special Master, p. 2). The results show no increase in B.O.D. at the times these reductions were made, which times corresponded with the increases in sewage treatment, thus indicating the wisdom of the Supreme Court in the decree limiting the diversion to 5,000 c.f.s. in 1936. From 1930 through 1938, in not a single month did the B.O.D. exceed 24 parts per million.

The results took a sudden turn for the worse, however, when the diversion was reduced to 1,500 c.f.s. on January 1, 1939. The B.O.D. increased to 28.5 p.p.m. for the month of January, 1939, which was much greater than for any previous month. In May, 1939, the B.O.D. reached an all-time maximum of 42.3 p.p.m. There is nearly always a reduction later in the summer, in August and September, as the initial explosive effect of sludge putrefaction wears off (see Mohlman Exhibit 8). In 1939 the B.O.D. receded to a minimum of 13.2 p.p.m. in December, but in the spring of 1940, it again reached an average of 28 p.p.m. in May. A great increase occurred in December, 1940, as a result of the scouring out of sludge solids during the 10-day flushing test. It was expected that the B.O.D. should be substantially lower after this test, but on the contrary the B.O.D. for January, 1941, was much greater than in January, 1940, slightly greater than in January, 1938, but less than in January, 1939 (Report of Special Master, p. 70).

The actual condition of the water therefore in 1941 has suffered a setback and the need for additional diversion will be greater in 1941 than in 1940.

Dissolved oxygen results are indicative of the condition of the water. The dissolved oxygen results in Exhibit 37A show an annual fluctuation of quite similar type until January 1, 1939. Each year the dissolved oxygen decreased nearly to zero in the summer, but there was always several

tenths of a part per million remaining. In 1939, however, the dissolved oxygen was zero for six months, May through October, and in 1940 four months, June through September. Exhibit 37A shows that in no previous year was there such a bad condition. There can be no sub-zero in dissolved oxygen, therefore the magnitude of the B.O.D. must be considered when dissolved oxygen records show zero. An excessive B.O.D. is shown in 1939 and 1940 and is expected in 1941.

(2) The Special Master apparently relied on the testimony of Callaghan and Andrew to compare past and present conditions of the Waterway, based on their memory of past conditions, which is proven to be faulty by an inspection of Exhibit 37A. Callaghan (Report of the Special Master, p. 27) said that in 1930 the water "was so thick you could almost paint with it. We almost had to get clothespins to put on our nose. Conditions are nowheres near as bad as they were then. They have been clearing up that water. Cleared it up, I would guess, at least 60 per cent."

The testimony of Mr. C. R. Andrew as to past and present conditions of the Waterway represents the best attempt of a competent engineer to recall, from memory only, the changes that have occurred in the condition of the water. He stated (Report of the Special Master, pages 19 to 21) that (a) "in 1933, when the dams were put into operation, the water continued to improve year by year", whereas Exhibit 37A shows no such improvement; (b) "in 1938 they were the best they had ever been," whereas Exhibit 37A shows as good or better conditions in 1928, 1931 and 1934. In fact the B.O.D. and dissolved oxygen results for 1934 and 1938 were quite similar. which would not bear out the Special Master's conclusion (p. 51) that conditions were steadily improving from 1930 to 1938, so that, as he concludes, the people of Joliet felt this improvement should continue.

The testimony of Callaghan and Andrew is contradictory; the former stated conditions were very bad in 1930, and cleared up about 60 per cent by 1940; whereas the latter (Master's Report, p. 20) stated that conditions in 1925 were very bad (as bad as in 1939) but "had improved greatly in 1930" (p. 19). The conflicting and uncertain nature of testimony of this sort should warrant its rejection in favor of the impersonal, quantitative data given in Exhibit 37A.

The data in Exhibit 37A prove conclusively that the condition of the water since January 1, 1939 has been much worse than at any time from 1925 through 1938. The flow prior to 1932 was more rapid below Joliet than after Brandon Dam was completed in 1933, but the analyses for B.O.D. show lower results for the years 1925 to 1930 than for the years 1933 to 1938.

(B) The results of analyses in Exhibit 37A show a decided improvement in the latter half of 1940, similar to the improvement in 1939. The flushing test from December 2 to 10, 1940, resulted in a greatly increased B.O.D. during the month of December, but it was expected that the partial cleanout of sludge from the Main Channel would result in much lower B.O.D. in January, 1941. However, as shown in Mohlman Exhibit 18a, b, c, d and 20, the actual conditions in 1941 are worse than in 1940 (Master's Report, p. 70), and also worse than in 1938.

The record at Lockport in 1940 and 1941 was as follows:

	January, 1940	January, 1941
Dissolved Oxygen	1.8	0.6
B.O.D.	14.8	22.9
Discharge, C.F.S.	2,949	2,781

The Special Master noted the lower flow in 1941 and stated (p. 70) that the lower dissolved oxygen in 1941 might be partly explainable because of the lower flow. However, the lower flow in 1941 is practically negligible in ac-

counting for the greatly increased B.O.D. and lower dissolved oxygen in 1941. The flow decreased only 6 per cent, whereas the dissolved oxygen decreased 67 per cent, and the B.O.D. increased 55 per cent.

The fact is quite apparent that there has been no improvement in the condition of the Waterway since the flushing test, but an actual deterioration. The Master concludes (p. 71) that, "insofar as one can reason from January to June, the B.O.D. figures seem to support the view that conditions in June, 1941, will be a great deal better than in 1939." However, he could have added, "but worse than in June, 1940" as shown by the data on page 70 of his Report. He concludes (p. 71) that "to the extent that more putrescible material has been deposited in the Pool, conditions in 1941 will be adversely affected," but hopes that the flushing test may have improved the conditions above Lockport, although the analyses do not indicate that this hope may be realized.

(C) The results of the flushing test certainly do not warrant any optimism as to the condition of Brandon Pool in the summer of 1941. The deposit of 4,827 tons of B.O.D. in the Pool (Table XIX, Mohlman Exhibit 17. Report on Flushing Experiment) is equivalent to an increase of B.O.D. next summer of about 6 p.p.m., for a period of three months and with a flow of 3,500 c.f.s., above that which would have occurred if the test had not been made. Referring to Ex. 37A, where the summer B.O.D. at Lockport in 1940 is shown to be 19 p.p.m., it is apparent that an increase of the magnitude of 6 p.p.m. would be of serious import in the summer of 1941. The maximum summer B.O.D. at Lockport, in 1939, averaged 28 p.p.m. It is therefore likely that the effect of the flushing test will be to make conditions in Brandon Pool in the summer of 1941 almost as bad as they were in the summer of 1939, and considerably worse than in 1940 or in earlier years.

The Master also concludes that conditions in Brandon Pool in the summer of 1941 will again be very bad, *vide*:

(p. 71) "I conclude that while it is reasonably certain that the B.O.D. conditions in the summers of 1941 and 1942 will be better than those of 1939, it is also most probable that there will be no dissolved oxygen at the Pool in the summer of 1941 and that there are likely again to be offensive odors at Joliet and Lockport."

(p. 113) "The extent of relief from offensive odors which will be afforded at Lockport and Joliet in the summer months of 1941 is very doubtful, but there is a better outlook for the summer months of 1942."

(D) The need for additional diversion in 1941 and 1942 will become acute in the early summer, particularly in May, June and July, when the sludge deposits begin to putrefy after lying dormant throughout the winter and spring months. (Mohlman Ex. 8) The Master's Report states (p. 31):

"In the chemical processes which are responsible for the development of gases and odors, the temperature of the water is controlling, not the temperature of the air. It was testified that actual sulfate decomposition does not occur when the temperature of the water falls below 62° Fahrenheit. The mean temperature of the water at Lockport in the months from April to September, in the years 1939 and 1940, according to the Sanitary District records, was as follows:

	1939	1940
April	56	50
May	71	58
June	71	70
July	76	74
August	77	73
September	75	72

Thus, water temperature was lower at Lockport in 1940 than in 1939 in each of the summer months."

In other parts of the Special Master's Report, he refers

to weather conditions as affecting the putrefaction of the water in the Pool:

> (p. 71) "Weather conditions will undoubtedly have a large influence not only upon the existence of odors but also upon the susceptibility of individuals to them."
>
> (p. 113) "Weather conditions will have an important influence."

The Special Master's emphasis on the effect of weather conditions is important, because the menace from foul conditions in Brandon Pool in the summer of 1941 will be greatly magnified if unseasonably high temperatures raise the water temperature in May, as occurred in 1939. An early rapid rise of temperature produces an explosive ebullition of gas which brings sludge to the surface of Brandon Pool, greatly increases the B.O.D. of the water, and disseminates nauseous odors far more intensively than occurs when the rise of temperature is slow and steady. With the greatly increased deposits of sludge in Brandon Pool, of greater putrescibility as shown in the Report on the Flushing Experiment (p. 22), an early rapid increase of water temperature will result in worse odors than those that occurred in the early summer of 1939. Therefore the need for relief by increased diversion of lake water will become very urgent in May, June and July, 1941. The Supreme Court should take cognizance of the danger of this disaster, which would subject the people of Joliet and Lockport to worse conditions than any heretofore endured.

II. Conclusions as to the Actual Conditions of the Illinois Waterway.

Illinois concludes that the record of analyses of water taken from the Waterway, as introduced in Ex. 37A, is the only reliable and impartial evidence regarding past and present conditions. These results show conclusively that

the conditions were very much the same from 1925 through 1938. The Supreme Court's Decree which cut the diversion to 6,500 c.f.s. on July 1, 1930, and again to 5,000 c.f.s. on January 1, 1936, did not result in any appreciable deterioration in the condition of the Waterway, because the reductions of diversion were justified by the increasing degree of sewage treatment by the Sanitary District of Chicago.

The reduction to 1,500 c.f.s. on January 1, 1939, however, resulted in a very great deterioration in condition of the water in the Waterway, to a far worse condition than at any time since 1925. The conditions in 1939 were deplorable. In 1940 there was some improvement, but in January, 1941, the water was much worse than in January, 1940, almost as bad as in January, 1939, and much worse than in any previous January, as demonstrated in Illinois Ex. 37A. The data presage a very bad condition in the summer of 1941, such that the relief necessary will be more urgent than in the summer of 1940. These conclusions are based upon analyses which are considered by Illinois to be the only reliable measure of the actual condition of the Illinois Waterway.

III.

In view of the Special Master's finding that there are no other ameliorating measures available, is this Court justified in authorizing a temporary increase in diversion during the summer months of 1941 and 1942, in the amounts and under the conditions proposed in Illinois' Petition as modified, in view of the fact that the actual effect upon health is serious and that the offensive and deplorable conditions in the Illinois Waterway at Brandon Pool will continue to exist in the summer months of 1941 and 1942?

The Special Master has concluded (pages 110-112 of his Report) that the following ameliorating measures, which include all the remedial or ameliorating measures first suggested by the opponent Lake States, were either not feasible or not available in 1941 and 1942:

(a) Dredging of Brandon Road Pool.

(b) Draining of Brandon Road Pool.

(c) Chlorinating Brandon Road Pool or its influent.

(d) Cascading water at Lockport.

(e) Supplying additional oxygen to influent of Brandon Road Pool through production of nitrates at North Side and Calumet Treatment plants.

(f) Chemical treatment at West Side plant.

(g) Chlorinating effluent from West Side Imhoff tanks.

(i) Compulsory water metering by the City of Chicago.

The Special Master has concluded (pages 112-113 of his Report) that the following measures, already adopted by the Sanitary District of Chicago, will ameliorate conditions in the Brandon Road Pool, but will either afford no sub-

stantial relief or will not be available for effective relief before the end of 1942:

(h) Budgeting of present water diversion.

(j) Constructing facilities at the Southwest plant for the treatment of the West Side Imhoff tank effluent by activated sludge.

(k) Installing additional equipment at the Southwest plant to provide complete treatment for increased quantities of sewage.

Ameliorating measure (h), namely, Budgeting of water presently available, has been in effect since January 1, 1939 in substantially the manner suggested in the Special Master's Report, with results conforming to the budgeted flow in the months in which the storm run-off approximated that which had been estimated, but with results radically different in certain other months when the storm flow departed widely from normal. The Special Master has rightly concluded that this ameliorating measure will not afford any substantial relief.

Ameliorating measure (j), namely, the construction of activated sludge treatment facilities, at the Southwest plant, to provide final treatment for the West Side sewage, which has already received preliminary treatment in the West Side Imhoff tanks, is a definite ameliorating measure. There has been complete agreement on this point between the technical experts representing Illinois and those representing the opponent Lake States. A program for the construction of these permanent facilities was adopted by the Sanitary District of Chicago before the present hearings in this case were started. Reasonable progress is being made on this construction, considering delays caused by the National Defense Program; but, for the reasons set forth in the Report of the Special Master (pages 105-109), it is obvious that these new facilities will not be completed before the end of 1942 and therefore the Special Master is justified in his conclusion that it is doubtful if this ameli-

orating measure can be made operative before the end of 1942.

Ameliorating measure (k), namely, installation of additional equipment at the Southwest plant to provide complete treatment for increased quantities of Southwest Side sewage, is another part of the permanent program, and will provide some improvement in the condition of Brandon Road Pool. The Special Master has stated that the extent of relief in 1941 is very doubtful, with a better outlook for the summer months of 1942, but that weather conditions will have an important influence.

It is apparent that no immediate feasible remedial or ameliorating measure is available for relief of the critical situation at Brandon Road Pool in 1941 and 1942 except the diversion of additional water.

Pearse (Rec. 218) testified that a diversion of 5,000 c.f.s. would improve the conditions over those existing prior to 1939. No temporary measures are available which can be quickly applied to obviate the conditions in Brandon Pool other than an increased diversion (Rec. 206).

Calvert (Rec. 3202) compared the beneficial effect of dilution with other remedial measures that have been suggested, and stated:

> "The dilution of polluted water improves the condition simply because of the dilution, because it makes possible the growth of more different kinds of life in that water. There is a better balanced biological life in the water. It also dilutes the organic matter so that its odor is reduced, and it reduces the time of holding in the Channel, or time of flow through the Channel, in addition to supplying oxygen which can be utilized by growing things."

Mohlman (Rec. 278; J. A. 202) stated that in time sewage treatment will improve conditions but the only immediate relief, until the West Side supplementary treatment is completed, is by increase of diversion, giving more dilu-

tion; an increase of diversion (Rec. 3284; J. A. 229) results in dilution of the polluted and nauseating conditions and practically halves the B.O.D., something none of the other emergency measures can accomplish.

Buswell was confident that chlorination would provide more certain relief at Brandon Pool than diversion of 3,500 additional c.f.s. (Rec. 2256; J. A. 442), yet he admitted that dilution reduces the B.O.D. more certainly than chlorine (Rec. 2271; J. A. 448) and he estimated that doubling the flow of water would approximately halve the time of flow to reach the Kankakee River, where additional dilution would occur (Rec. 2274; J. A. 448).

Andrew (Rec. 1509; J. A. 252) stated that an additional diversion will reduce the odors and that removing the pollution at its source or adding such amount of water as will prevent the odors are the only two feasible methods known to him.

Prof. Carlson indicated (Rec. 2898-2900; J. A. 286) that the reduction in flow on December 31, 1938, increased the menace to health, and he further noted that by increasing the flow the menace would be lessened and a very great reduction made in hydrogen sulfide and other odors, because of the increased dissolved oxygen, increased flow and increased current (Rec. 2980; J. A. 289).

Inasmuch as witnesses for Petitioner and Opponents agree that the critical period of nuisance and health hazard occurs during the warmer months, and there is no complaint or health hazard with 1,500 c.f.s. diversion in addition to domestic pumpage during the colder months, it is logical to budget increased diversion on a graduated scale, reaching a maximum in mid-summer and tapering off in spring and fall to the present authorized 1,500 c.f.s. in addition to domestic pumpage.

The critical temperature was stated by Enslow to be 62 deg. Fahr. (Rec. 1992-1993; J. A. 395).

The temperature record of the water at Lockport is as follows (Exhibit 34 and Rec. 1840; J. A. 210):

Month	Deg. Cent. 1939	Deg. Cent. 1940	Deg. Fahr. 1939	Deg. Fahr. 1940
Jan.	5.0	1.5	41	35
Feb.	3.5	5.0	38	41
Mar.	6.5	5.5	45	42
Apr.	13.5	10.0	56	50
May	17.5	14.5	64	58
June	21.5	21.0	71	70
July	24.5	23.5	76	74
Aug.	25.0	23.0	77	73
Sept.	24.0	22.0	75	72
Oct.	18.0	18.5	64	65
Nov.	11.5	—	53	—
Dec.	8.0	—	46	—

A graduated scale of increased diversion was suggested for 1941 and 1942 (Mohlman Exhibit 14a to 14e), which would provide additional diversion as follows:

ADDITIONAL DIVERSION IN CUBIC FEET PER SECOND.

Month	1941	1942
April	1,000	.....
May	3,000	2,000
June	5,000	4,000
July	6,000	5,000
August	5,000	3,000
September	3,000	1,000
October	1,000	.....

This budgeting of increased diversion is more effective than a uniform additional flow of 3,500 c.f.s. every month in the year, and yet, on an annual basis, the variable increases suggested would average only 2,000 c.f.s. for 1941, and 1,250 c.f.s. for 1942. The actual requirements should be based on the results of analyses of the dissolved oxygen content of the water above the dam at Brandon Pool. At

least 1 p.p.m. of dissolved oxygen should be present (Mohlman Exh. 14e).

Illinois' Petition, as modified, for regulated diversion to produce a minimum of one part per million of dissolved oxygen in the water of Brandon Pool, is based upon a scientific and feasible procedure for affording relief from the deplorable conditions that have occurred in the Waterway in the summers of 1939 and 1940, and threaten to recur with greater intensity in the summer of 1941.

(A) The Master recognized the necessity for the presence of dissolved oxygen for prevention of odors of putrefaction:

> (p. 56) "The 5-day B.O.D. indicates the avidity for oxygen. The supply of oxygen in a stream to meet this demand is determined by the amount of dissolved oxygen in the water. The relation between B.O.D. and available oxygen is known as the oxygen balance. If the dissolved oxygen is less than the oxygen demand, the water is putrescible. However, so long as dissolved oxygen is present, the water is not actually in a putrefactive state. When the dissolved oxygen is exhausted, putrefaction sets in, accompanied by offensive odors."

(B) The Special Master found (p. 56) that "The weight of opinion seems to be that the presence of any dissolved oxygen is sufficient; compare *New York* v. *New Jersey*, 256 U. S. 296, 311, decided in 1921".

The Court in the case of *New York* v. *New Jersey, supra*, considered that 25 to 50 per cent of saturation is the amount of dissolved oxygen necessary to prevent the appearance of offensive odors from decomposition of organic matter deposited in the body of water under consideration. The evidence shows that Lake Michigan has about 8 p.p.m. dissolved oxygen in summer and 12 p.p.m. in winter, so that upon applying the yardstick laid down in the *New York* v *New Jersey* case to the instant situation, there would be

required during the warmer months in the Brandon Pool 2 to 4 p.p.m. of dissolved oxygen to prevent the noxious and foul gaseous odors.

(C) Pearse (Rec. 195) testified that the amount of dissolved oxygen necessary should be a minimum of 3 p.p.m.

(D) Illinois, in its Petition, as modified, did not, however, request from 2 to 4 p.p.m. (average 3 p.p.m.) as a standard for maintenance of satisfactory conditions in Brandon Pool, but voluntarily lowered the standard to a minimum of 1.0 p.p.m., as a temporary standard designed to afford a reasonable degree of amelioration of the condition of Brandon Pool during the emergency in the summers of 1941 and 1942.

It is not feasible to maintain a minimum of, say 0.1 or 0.2 p.p.m. of dissolved oxygen in Brandon Pool in summer, because of the hourly variations which might quickly change within an hour from several tenths, or even one p.p.m. down to zero, or less if there could be a sub-zero. When zero is recorded, it is impossible to determine any sub-zero value, except as two samples might have a zero dissolved oxygen and one might have a 5-day B.O.D. of, say, 10 p.p.m. while the other one might have a 5-day of 40 p.p.m. or more. In this case the sample with the higher B.O.D. would obviously be far more putrescible and odorous than the sample with the lower B.O.D., but this difference would not be indicated in any way by the dissolved oxygen determination. It would require five days to make the B.O.D. determination. Therefore it is impossible to use zero dissolved oxygen as a minimum standard, and even several tenths p.p.m. is not a feasible standard.

For these reasons, the minimum standard of dissolved oxygen in Illinois' Petition as modified was set at one p.p.m. It is a low standard, and not in any way an excessive requirement.

(E) The Master may have considered the standard of

1.0 p.p.m. more than necessary because he stated (pages 70-71):

> "in the summer of 1938 there was only 0.2. This 1938 figure would fall below the minimum of 1 p.p.m. of D.O. which the Sanitary District (*sic*—should be State of Illinois) in its modified petition claims to be essential."

The reasons why the standard was placed at a minimum of 1.0 p.p.m. dissolved oxygen have been given above. However, if as implied by the Special Master, this is a high standard, as compared with 0.2 p.p.m. mentioned by him as the average for the summer of 1938, it might be helpful to compute the additional amount of lake water required to make up the difference between 0.2 and 1.0 p.p.m., when added to a flow of 3,700 c.f.s., the maximum available for summer months with the present diversion. An additional flow of 423 c.f.s. of lake water at 8.0 p.p.m. D.O. would increase the D.O. from 0.2 to 1.0 p.p.m. if the sludge demand did not abstract D.O. from the additional flow of lake water.

The increased diversions requested by Illinois are necessary to satisfy demands of effluents and sludge deposits, and not to build up an excess of dissolved oxygen at Brandon Pool. If 0.2 p.p.m. were maintained it would take only 423 c.f.s. more to bring the D.O. up to 1.0 p.p.m. It would be difficult to adjust the diversion closer than plus or minus 400 c.f.s. to produce a given D.O. content at Brandon Pool, considering the rapid variations in hourly and daily results, shown for example in the individual hourly fluctuations during the flushing test.

The standard of a minimum of 1.0 p.p.m. D.O. at Brandon Pool is therefore as low as it is possible to go safely; it is a standard that would require only a small additional amount of diversion above that necessary to attempt to maintain a minimum of 0.2 p.p.m.; and it is a standard substantially lower than the one specified in *New York* v. *New Jersey*, mentioned ***supra***.

The modified request of Illinois "prays that the Decree be modified so that the actual amount of diversion of water and the periods of time of such diversion be based on the results of a continuation of the actual analyses made by The Sanitary District of Chicago and verified by whomsoever this Court may designate, with a provision that the daily reports of the results, together with the record of the increased diversion of flow, be transmitted to the United States Engineer in Chicago and monthly reports filed with the Clerk of this Court and copies thereof transmitted to the respective Attorney Generals of the opposing Lake States."

The proposal of Illinois can be accomplished by a modification of the Decree of April 21, 1930, to provide for maximum limitations as specified in the modified request of Illinois, and minimum diversions to be determined by scientific analyses to be made on samples of water collected hourly above Brandon Dam, the collection and analyses to be made by the present personnel of the Illinois River Investigations of The Sanitary District of Chicago, which have acted continuously since 1925. The results of analyses and diversions of water from Lake Michigan can be reported for each 24-hour period to a competent expert, either an engineer or a chemist, appointed by the Supreme Court for the purpose of checking and verifying the accuracy of such reports. Copies therefor can be transmitted by such Court appointees to the Attorneys General of the Great Lakes States and to the U. S. District Engineer at Chicago, cooperation between The Sanitary District of Chicago and the U. S. District Engineer to be continued as heretofore, with reference to daily or hourly rates of diversion.

No measurable harm will be done to the Great Lakes States by the increased diversion from Lake Michigan, suggested by the modified request of Illinois, which will result in a trifling temporary lowering of the lake levels

of Lakes Michigan, Huron and Erie during the years 1941 and 1942. From the findings of the Special Master, Charles Evans Hughes, in 1927, the conclusion is reached that if the aforesaid temporary diversions are allowed, then the temporary lowering effect will be not more than one-half inch in 1941 and not more than one-third inch in 1942 on Lakes Michigan, Huron and Erie (Hughes Original Report 95-96, 104-105; Hughes Re-reference Report 139-140).

In the Report of Special Master Charles E. Hughes on Re-reference (1929), the following recommendation was made (p. 138):

> "Provision should be made for further examination, after the sewage treatment plants have been completed, and the effect of the effluent therefrom with the storm water flow on the navigable channels has been observed, to the end that the question of any further or other relief may have appropriate consideration in the light of actual conditions."

This statement reflects the concern felt by Special Master Hughes as to the actual conditions of the Waterway, *after* the sewage treatment works have been completed, with a diversion of 1,500 c.f.s., and the decree of the court as thereafter entered, which permitted any of the parties to apply thereafter for relief, likewise contemplated further consideration if the conditions so warranted. The conditions in the Waterway will obviously be better, after the treatment works are completed, than they will be in 1941 and 1942. Therefore the examination of the actual conditions by the court is even more necessary now, with incomplete treatment of sewage, than it will be after completion of the sewage treatment program.

"In the light of actual conditions" is interpreted by Illinois to mean "as shown by chemical analysis." The actual conditions are shown in the results of analyses presented in Exhibit 37A. These results show plainly the great deterioration in the condition of the Waterway since

January 1, 1939, and demonstrate the need of additional diversion to restore conditions to those that prevailed prior to January 1, 1939.

III. Conclusions as to a Temporary Decrease in Diversion.

Illinois concludes that this Court is justified in authorizing a temporary increase in diversion during the summers of 1941 and 1942 in accordance with Illinois' Petition as modified, because there is no other feasible ameliorating measure available; the condition of the Waterway will be worse in the summer of 1941 than in 1940 or any summer prior to 1939; a reasonable standard of dissolved oxygen content is requested, that is lower than specified in *New York* v. *New Jersey,* 256 U. S. 296, 311; and the actual conditions warrant appropriate consideration by this Court, to the end that relief may be granted until the sewage treatment program of the Sanitary District is finished.

Summary and Recommendations for a Decree.

The State of Illinois in seeking relief herein bases its argument upon the balance of equity and limits its request to such increase in diversion as to enable the maintenance of a minimum of 1 p.p.m. of dissolved oxygen during the warm weather months of 1941 and 1942 in the water above the dam at Brandon Pool.

The evidence demonstrates without refutation and the Special Master so reported (p. 51) that conditions in 1939 were far more serious than in any previous year, and the Waterway was contaminated, as stated by the Secretary of War, "to a greater extent than contemplated." It was further shown by the evidence that in 1940 the conditions were worse than in any years previous to 1939, and that such conditions will continue to exist until the sewage treatment construction program of the Sanitary District

is completed, which cannot be accomplished before the end of 1942.

By the reduction in diversion on December 31, 1938, there was produced an actual menace to health through the high concentration of pollution in the Waterway; that beyond this unnecessary health hazard the conditions have caused an actual injury to health resulting from the gaseous odors. The evidence further shows and the Special Master so found (p. 72 to 109 and 110 to 113) that there are no temporary feasible, remedial or ameliorating measures to reduce such menace to health, or to minimize the injury to health, available to the State of Illinois. A temporary increase in the diversion of fresh water from Lake Michigan during 1941 and 1942, therefore is the only feasible remedial or ameliorating measure available.

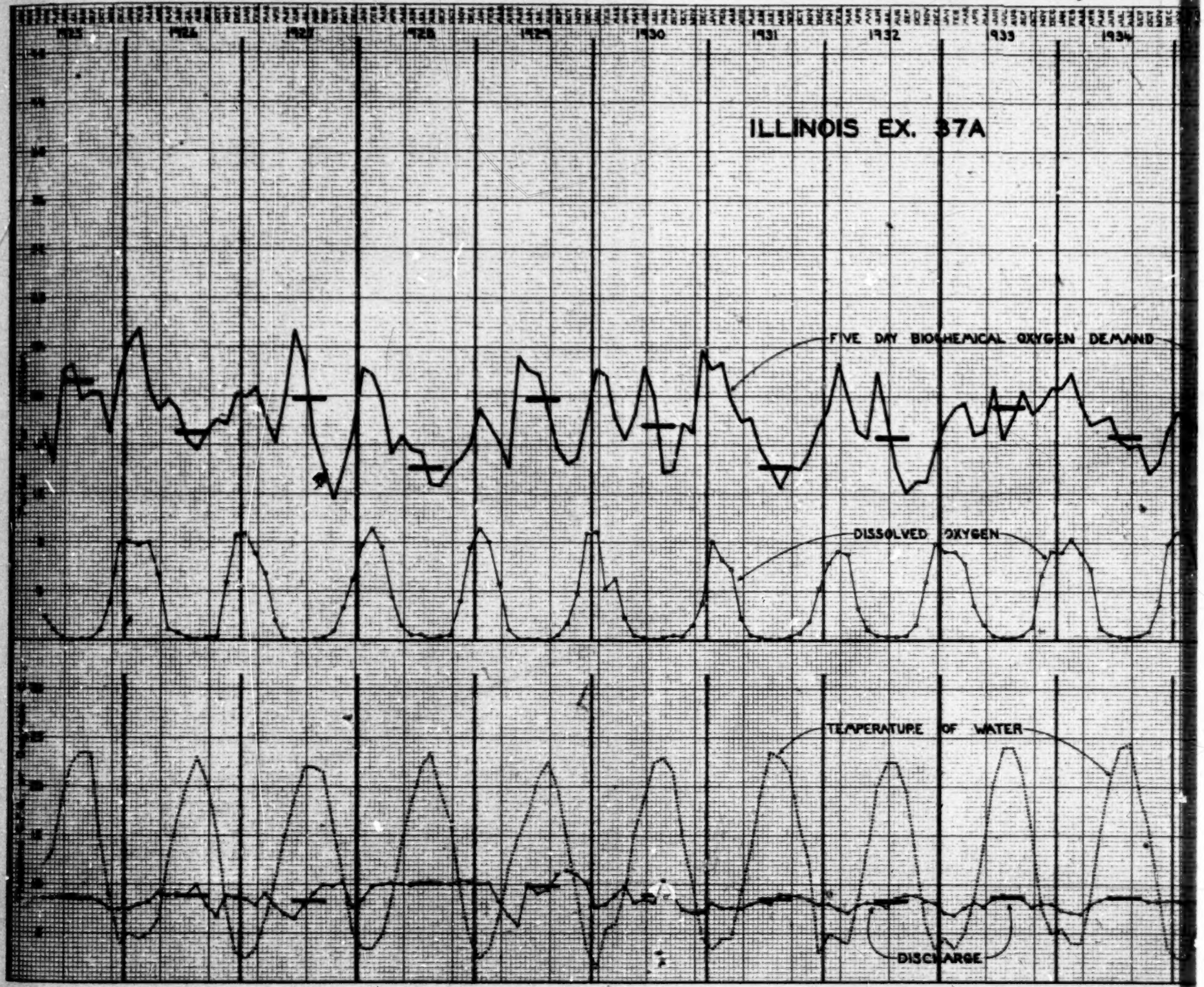
WHEREFORE, the State of Illinois respectfully urges that Paragraph 3 of the decree of the Court of April 21, 1930, in this cause be temporarily modified so as to permit a temporary increased diversion of water during the summer months of 1941 and 1942, subject to the supervision prescribed and in accordance with the petition of the State of Illinois as modified, and set forth in this brief and argument.

Respectfully submitted,

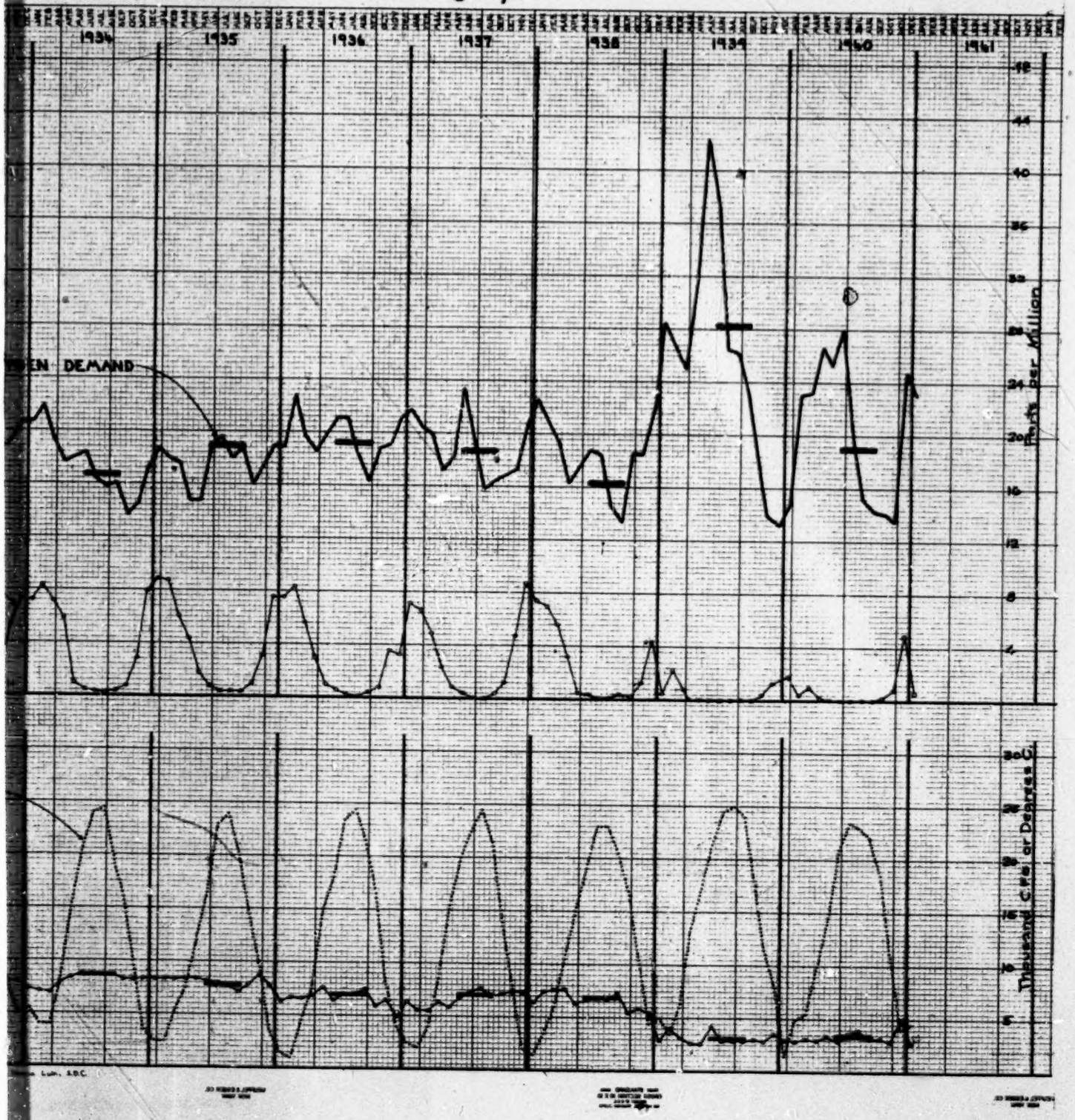
STATE OF ILLINOIS,
GEORGE F. BARRETT,
Attorney General of the State of Illinois,
Attorney for the Petitioner.

WILLIAM C. CLAUSEN,,
ALBERT J. MESEROW,
Assistant Attorney Generals,
Of Counsel.

MAIN CHANNEL at LOCKPORT (292 miles from Grafton Ferry; 35



Ferry; 35 miles from Lake Michigan.)



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Supreme Court, U. S.
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IN THE

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, A. D. 1939

STATES OF WISCONSIN, MINNESOTA, OHIO AND PENNSYLVANIA, COMPLAINANTS, v. STATE OF ILLINOIS AND THE SANITARY DISTRICT OF CHICAGO, DEFENDANTS,	No. 2 Original.
STATES OF MISSOURI, KENTUCKY, TENNESSEE, LOUISIANA, MISSISSIPPI AND ARKANSAS, INTERVENING DEFENDANTS. STATE OF MICHIGAN, COMPLAINANT, v. STATE OF ILLINOIS AND THE SANITARY DISTRICT OF CHICAGO, et al., DEFENDANTS.	No. 3 Original.
STATE OF NEW YORK, COMPLAINANT, v. STATE OF ILLINOIS AND THE SANITARY DISTRICT OF CHICAGO, et al., DEFENDANTS.	No. 4 Original.

Notice of Filing

PETITION OF THE STATE OF ILLINOIS FOR TEMPORARY MODIFICATION OF PARAGRAPH 3 OF DECREE OF APRIL 21, 1930.

JOHN E. CASSIDY,
Attorney General of the State of Illinois,
Attorney for Petitioner.

14 (A-12817—100)

IN THE

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, A. D. 1939

STATES OF WISCONSIN, MINNESOTA, OHIO AND PENNSYLVANIA, COMPLAINANTS, v. STATE OF ILLINOIS AND THE SANITARY DISTRICT OF CHICAGO, DEFENDANTS,	No. 2 Original.
STATES OF MISSOURI, KENTUCKY, TENNESSEE, LOUISIANA, MISSISSIPPI AND ARKANSAS, INTERVENING DEFENDANTS. STATE OF MICHIGAN, COMPLAINANT, v. STATE OF ILLINOIS AND THE SANITARY DISTRICT OF CHICAGO, et al., DEFENDANTS.	No. 3 Original.
STATE OF NEW YORK, COMPLAINANT, v. STATE OF ILLINOIS AND THE SANITARY DISTRICT OF CHICAGO, et al., DEFENDANTS.	No. 4 Original.

NOTICE

To: John E. Martin, Attorney General of the State of Wisconsin, Madison, Wisconsin.

J. A. A. Burnquist, Attorney General of the State of Minnesota, St. Paul, Minnesota.

Claude T. Reno, Attorney General of the State of Pennsylvania, Harrisburg, Pennsylvania.

Thomas J. Herbert, Attorney General of the State of Ohio, Columbus, Ohio.

Raymond W. Starr, Attorney General of the State of Michigan, Lansing, Michigan.

John J. Bennett, Jr., Attorney General of the State of New York, Albany, New York.

You, and each of you, are hereby notified that on the 8th day of January, 1940, I shall file with the Clerk of the Supreme Court of the United States the petition of the State of Illinois for temporary modification of Paragraph 3 of Decree of April 21, 1930, in the above entitled cause.

John E. Cassidy
Attorney General of the State of Illinois.

PROOF OF SERVICE

STATE OF ILLINOIS }
COUNTY OF COOK } ss.

WILLIAM C. CLAUSEN, being on his oath first duly sworn, deposes and says that at the direction of John E. Cassidy, Attorney General of the State of Illinois he served a copy of the Petition of the State of Illinois for temporary modification of Paragraph 3 of Decree of April 21, 1930, in the foregoing entitled cause, on the 8th day of January, 1940, on

John E. Martin, Attorney General of the State of Wisconsin,

Madison, Wisconsin.

J. A. A. Burnquist, Attorney General of the State of Minnesota,
St. Paul, Minnesota.

Claude T. Reno, Attorney General of the State of Pennsylvania,
Harrisburg, Pennsylvania.

Thomas J. Herbert, Attorney General of the State of Ohio,
Columbus, Ohio.

Raymond W. Starr, Attorney General of the State of Michigan,
Lansing, Michigan.

John J. Bennett, Jr., Attorney General of the State of New York,
Albany, New York.

by depositing in the United States Post Office at Chicago, Illinois, envelopes containing a copy of the above notice and a copy of the petition therein referred to; each envelope bearing 12 cents uncancelled United States postage stamps and addressed to each of the addresses of said notice at their respective addresses as in said notice stated.

William P. Clancy

SUBSCRIBED AND SWORN TO BEFORE ME this 8th day of January, A. D. 1940.

Mary Griffin
Notary Public.

FILE COPY

Office - Supreme Court, U. S.
FILED
JAN 11 1940
CHARLES ELMORE CROPLEY
CLERK

IN THE

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, A. D. 1939

STATES OF WISCONSIN, MINNESOTA, OHIO AND PENNSYLVANIA, COMPLAINANTS, v. STATE OF ILLINOIS AND THE SANITARY DISTRICT OF CHICAGO, DEFENDANTS,	No. 2 Original.
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PETITION OF THE STATE OF ILLINOIS FOR TEMPORARY MODIFICATION OF PARAGRAPH 3 OF DECREE OF APRIL 21, 1930.

JOHN E. CASSIDY,
Attorney General of the State of Illinois,
Attorney for Petitioner.

14 (A-12816—100)